EXHIBIT 16

4.9 Marine Mammals

What Is in This Section?

Executive Summary

The DWH oil spill resulted in the contamination of prime marine mammal habitat in the estuarine, nearshore, and offshore waters of the northern Gulf of Mexico. In order to determine the exposure and injury to whales and dolphins due to the DWH oil spill, the Trustees synthesized data from specific NRDA field studies, stranded carcasses collected by the Southeast Marine Mammal Stranding Network, historical data on marine mammal populations, NRDA toxicity testing studies, and the published literature. Tens of thousands of marine mammals were exposed to the DWH surface slick, where they likely inhaled, aspirated, ingested, physically contacted, and absorbed oil components. The oil's physical, chemical, and toxic effects damaged tissues and organs, leading to a constellation of adverse health effects, including reproductive failure, adrenal disease, lung disease, and poor body condition. Animals that succumbed to these adverse health effects contributed to the largest and longest-lasting marine mammal unusual mortality event (UME) on record in the northern Gulf of Mexico. The dead, stranded dolphins in the UME included near-term fetuses from failed pregnancies. Similarly, in the 5 years after the oil spill, more than 75 percent of pregnant dolphins observed within the oil spill footprint failed to give birth to a viable calf.

Based on the Trustees' scientific findings, the DWH oil spill is the most likely explanation for the injuries to marine mammals observed since May 2010 in the oil spill footprint. The increases in mortality, reproductive failure, and specific adverse health effects were seen in animals within the oil spill

wellhead, contaminated sediments persisted at least into 2014 (Hayworth et al. 2015) (Section 4.2, Natural Resource Exposure). Critical pathways of exposure include the contaminated water column, where marine mammals swim and capture prey; the surface slick at the air:water interface, where marine mammals breathe, rest, and swim; and contaminated sediment, where marine mammals forage and capture prey.

Source: *NOAA. Photo taken under NMFS permit.*

Figure 4.9-7. A group of rough-toothed dolphins swim through thick oil offshore on June 16, 2010.

4.9.3.1 Overlap of Marine Mammal Populations and the Surface Oil Footprint

Whether in the area contaminated by the deep-sea plume, at the surface, or in BSE habitats, a variety of cetacean species rely upon the habitat and resources within the DWH oil spill footprint, as shown in Figure 4.9-8 (Dias 2015; Jefferson & Schiro 1997; Waring et al. 2013). Population distributions (as defined by tracking with radio or satellite tags or via acoustic monitoring, aerial and vessel surveys, and historical survey data) demonstrated that the DWH oil spill footprint overlapped with the known ranges of 31 stocks of northern Gulf of Mexico marine mammals (Dias 2015; Waring et al. 2013).

During the spill, response workers and Trustees documented, photographed, and recorded videos of marine mammals present in areas contaminated by oil ranging from light sheen to thick, heavy oil (Dias 2015). Figure 4.9-4, Figure 4.9-6, and Figure 4.9-7 document some of these animals swimming in oil. Between April 28 and September 2, 2010, the Trustees conducted marine mammal surveys in the northern Gulf of Mexico and around the DWH oil spill site. Vessel and aerial marine mammal surveys, as well as reports from response monitoring activities, documented nearly 1,400 marine mammal sightings of at least 11 cetacean species swimming in oil (Table 4.9-2). In addition to the documentation of direct exposure, additional exposure to oil was estimated by overlapping the marine mammal sightings with the oil footprint. A total of 510 cetacean sightings with over 6,400 animals overlapped with the oil footprint between April 28 and August 10, 2010 (Figure 4.9-8) (Dias 2015). In addition, between May 2010

Table 4.9-2. Response workers and scientists observed nearly 1,400 marine mammals swimming in DWH surface oil or with oil on their bodies during response activities and as part of NRDA boat and helicopter surveys (Dias 2015).

Species	Number of Occurrences	Number of Individuals
Atlantic spotted dolphin	1	71
Clymene dolphin	1	1
Common bottlenose dolphin	35	329
Cuvier's beaked whale	1	1
Pantropical spotted dolphin	3	205
Pygmy sperm whale	1	2
Risso's dolphin	3	127
Rough-toothed dolphin	4	75
Sperm whale	19	33
Spinner dolphin	2	283
Striped dolphin	2	130
Unidentified dolphin	10	130
Unidentified mammal	3	7
Total	**85**	**1,394**

greater degree and magnitude of injury (Figure 4.9-16). For example, Barataria Bay dolphins experienced 35 percent excess mortality; 47 percent of the spinner dolphin stock range in the northern Gulf of Mexico experienced oiling equal to or greater than Barataria Bay, and, therefore, would have experienced at least a 35 percent mortality increase. Thus, the entire northern Gulf of Mexico spinner dolphin stock experienced a 16 percent mortality increase (0.35 x 0.47 = 0.16). The results of these calculations for each shelf and oceanic stock are presented in Table 4.9-6.

Table 4.9-5. This table presents estimates of pre-spill abundance and percentage of population exposed to DWH oil for each northern Gulf of Mexico cetacean stock with quantifiable injury (DWH MMIQT 2015). Cetaceans experiencing a level of surface oiling similar to or greater than that experienced by bottlenose dolphins in Barataria Bay would likely have suffered a similar or greater degree and magnitude of injury.

Cetacean Stock	Pre-spill Abundance Estimate	95% CI	Population Exposed to Oil (%)	95% CI
Bottlenose dolphin Barataria Bay	2,306	1,973-2,639	NA	NA
Bottlenose dolphin Mississippi River Delta	820	657-984	NA	NA
Bottlenose dolphin Mississippi Sound	4,188	3,617-4,760	NA	NA
Bottlenose dolphin Mobile Bay	1,393	1,252-1,535	NA	NA
Bottlenose dolphin western coastal	20,161	14,482-28,066	23	16-32
Bottlenose dolphin northern coastal	7,185	4,800-10,754	82	55-100
Continental shelf dolphins[a]	63,361	42,898-87,417	13	9-19
Bottlenose dolphin oceanic	8,467	4,285-16,731	10	5-20
Sperm whale	1,635	1,132-2,359	16	11-23
Bryde's whale	26	12-56	48	23-100
Beaked whales[b]	1,167	643-2,117	12	7-22
Clymene dolphin	3,228	1,558-6,691	7	3-15
False killer whale	316	121-827	18	7-48
Melon-headed whale	1,696	709-4,060	15	6-36
Pantropical spotted dolphin	33,382	25,489-43,719	20	15-26
Short-finned pilot whale	1,641	710-3,790	6	4-9
Pygmy killer whale	281	131-601	15	7-33
Pygmy/dwarf sperm whales[c]	6,690	3,482-12,857	15	8-29
Risso's dolphin	1,848	1,123-3,041	8	5-13
Rough-toothed dolphin	2,414	964-6,040	41	16-100
Spinner dolphin	6,621	3,386-12,947	47	24-91
Striped dolphin	2,605	1,537-4,415	13	8-22

[a] Continental shelf dolphins is a combination of shelf bottlenose dolphins and Atlantic spotted dolphins.

[b] Beaked whales is a combination of Blainville's beaked whales, Cuvier's beaked whales, and Gervais' beaked whales.

[c] Pygmy/dwarf sperm whales is a combination of pygmy sperm whales and dwarf sperm whales.

For coastal stocks, the excess mortality estimates are 1 percent (confidence interval of 1 to 2 percent) and 38 percent (confidence interval of 26 to 58 percent) for the western and northern coastal stocks,

respectively (DWH MMIQT 2015). The increase in mortality due to DWH oil exposure in the shelf and oceanic stocks ranges from 2 to 17 percent of each population (DWH MMIQT 2015).

Table 4.9-6. The DWH oil spill caused the deaths of shelf and oceanic cetaceans throughout the surface slick footprint. This table presents the estimated percentage of each stock that died due to the DWH oil spill (above baseline).

Cetacean Stock	Population Killed (%)	95% CI
Continental shelf dolphins[a]	4	2-6
Bottlenose dolphin oceanic	3	1-5
Sperm whale	6	2-8
Bryde's whale	17	7-24
Beaked whales[b]	4	2-6
Clymene dolphin	2	1-4
False killer whale	6	3-9
Melon-headed whale	5	2-7
Pantropical spotted dolphin	7	3-10
Short-finned pilot whale	2	1-3
Pygmy killer whale	5	2-8
Pygmy/dwarf sperm whales[c]	5	2-7
Risso's dolphin	3	1-4
Rough-toothed dolphin	14	6-20
Spinner dolphin	16	7-23
Striped dolphin	5	2-7

[a] Continental shelf dolphins is a combination of shelf bottlenose dolphins and Atlantic spotted dolphins.

[b] Beaked whales is a combination of Blainville's beaked whales, Cuvier's beaked whales, and Gervais' beaked whales.

[c] Pygmy/dwarf sperm whales is a combination of pygmy sperm whales and dwarf sperm whales.

4.9.5.2 Reproductive Failure

The Trustees have determined that DWH oil exposure resulted in the increased number of dead, stranded perinates and the unexpected number of unsuccessful pregnancies documented during Barataria Bay and Mississippi Sound surveys. The numbers of reproductive failures in these health assessment studies were above the expected baseline failures, based on historical monthly perinate stranding averages and reproductive failure rates in the bottlenose dolphin reference stocks in the southeastern United States. The increased reproductive failure rates in pregnant females exposed to DWH oil will have a negative impact on each population stock.

From 2011 to 2014, researchers tracked the numbers of pregnant females and successful pregnancies identified during health assessments and by measuring hormone levels in blubber biopsies (DWH MMIQT 2015). The Trustees pooled data from Barataria Bay and Mississippi Sound to achieve a reasonable sample size. Researchers found an excess of 46 percent (confidence interval of 21 to 65 percent) failed pregnancies in Barataria Bay and Mississippi Sound compared to the expected rate of reproductive failure based on reported observations from the Charleston, South Carolina; Indian River Lagoon, Florida; and Sarasota Bay, Florida, bottlenose dolphin populations (DWH MMIQT 2015). In other words, exposure to DWH oil caused 46 percent of pregnant females in Barataria Bay and Mississippi

Table 4.9-11. The DWH oil spill negatively impacted coastal and oceanic cetacean stocks throughout the surface slick footprint. This table presents the results of population models for each stock.

Cetacean Stock[a]	Lost Cetacean Years	Years to Recovery[b]	Maximum Population Reduction (%)
Continental shelf dolphins[c]	359,996	NA	-3
Bottlenose dolphin oceanic	37,668	NA	-4
Sperm whale	13,197	21	-7
Bryde's whale	705	69	-22
Beaked whales[d]	7,838	10	-6
Clymene dolphin	12,167	NA	-3
False killer whale	3,422	42	-9
Melon-headed whale	14,887	29	-7
Pantropical spotted dolphin	363,780	39	-9
Short-finned pilot whale	5,304	NA	-3
Pygmy killer whale	2,501	29	-7
Pygmy/dwarf sperm whales[e]	49,100	11	-6
Risso's dolphin	6,258	NA	-3
Rough-toothed dolphin	50,464	54	-17
Spinner dolphin	188,713	105	-23
Striped dolphin	18,647	14	-6

[a] Confidence intervals for shelf and oceanic animals were not calculated (see DWH MMIQT 2015 for details).

[b] It was not possible to calculate YTR for stocks with maximum population reductions of ≤ 5% (see DWH MMIQT 2015 for details).

[c] Continental shelf dolphins is a combination of shelf bottlenose dolphins and Atlantic spotted dolphins.

[d] Beaked whales is a combination of Blainville's beaked whales, Cuvier's beaked whales, and Gervais' beaked whales.

[e] Pygmy/dwarf sperm whales is a combination of pygmy sperm whales and dwarf sperm whales.

Two species of particular concern are the endangered sperm whales and Bryde's whales. For sperm whales, DWH oil exposure resulted in 13,197 LCY and a 7 percent maximum decline in population size, requiring 21 YTR (Table 4.9-11) (DWH MMIQT 2015). For Bryde's whales, 48 percent of the population was impacted by DWH oil, resulting in an estimated 22 percent maximum decline in population size that will require 69 YTR. Due to the very small Bryde's whale population size (26 animals, confidence interval of 12 to 56), the number of LCY is only 705. These results, however, should be interpreted with caution, for Bryde's whales, in particular. Small populations are highly susceptible to stochastic, or unpredictable, processes and genetic effects that can reduce productivity and resiliency to perturbations. The population models do not account for these effects, and, therefore, the capability of the Bryde's whale population to recover from this injury is unknown (Table 4.9-11) (DWH MMIQT 2015).